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AUTHOR Pond, Marlene R.; Newman, Isadore
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ABSTRACT

The effects of wait-time, the pause following a teacher question and the pause after a student response, on the length and number of student responses were analyzed at different cognitive levels. Data were obtained from 95 students in grade 4 and from 5 teachers using a wait-time of 5 seconds. Four oral discussion sessions by teachers and students on four stories from the Houghton-Mifflin Reading Series "Kaleidoscope" were recorded (yielding 48 recordings). Extended wait-time increased the number of correct responses to textually implicit material on standardized reading tests. No significant interaction was found between wait-time treatment and reading ability level for textually implicit questions. For textually explicit questions, wait-time did not increase the number of correct responses. Results indicate that not all types of learners benefit from wait-time under all conditions, but there does appear to be an advantage to increased time to consider questions. The success of the extended wait-time may have been due to the students' involvement in the strategy. Students need to be made aware of the wait-time strategy, have its value explained to them, and have the opportunity to use it throughout the school day. Eighteen pages of tables and five graphs are appended. (SLD)

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by

Marlene R. Pond
Warren City Schools
Warren, Ohio

Isadore Newman
Office of Research
and Evaluation
University of Akron
Akron, Ohio

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DIFFERENTIAL EFFECTS OF WAIT-TIME ON TEXTUALLY EXPLICIT AND IMPLICIT RESPONDING : INTERACTIONAL EXPLANATION

Marlene R. Pond, Ph.D.
Isadore Newman, Ph.D.

In the past, research in reading has generally dealt with the mechanics or processes of reading; that is, research has focused on the perception, recognition, and pronunciation of the printed word. Spiro, Bruce, and Brewer (1980) in Theoretical Issues in Reading Comprehension state, "By far, the largest share of basic research in reading has been concerned with the process of going from symbols to sounds and from written words to spoken words" (p.1).

Until recent years there has been considerably less research on the product of reading--comprehension. The product of reading is manifested in the understanding of the author's intent in writing and the interpretation of that intent by the reader, i.e., comprehension. In the past 10 years, however, research has shifted away from the study of the fragmented pieces of reading to the more holistic, global aspects of reading.

Pearson (1981) and Samuels (1980) have hypothesized that this increased interest in comprehension as a research topic revolves around four reasons. First, the field of psychology has broken from strict behaviorism, so popular into the 60s, to include cognitive psychology. Formally only observable behavior was considered acceptable study. Only now, with the support of cognitive psychologists, is the study of the interwoven, internal aspects of comprehension approached.

Secondly, the softening of the philosophical disagreements on the teaching of word identification has allowed more energy for examining comprehension. There has been a closer consolidation in the dichotomous views of the meaning and code emphasis "camps." Pearson (1981) reports, "We seem to be headed toward a rather uniform eclecticism when it comes to word identification" (p. 2).

Thirdly, there appears to be a nationwide trend in standardized reading testing. Starting in kindergarten and continuing through third grade, the test scores show an overall increase in achievement; however, beginning in fourth grade and persisting through the intermediate grades and beyond, there begins a steady decline in the growth patterns in reading. Pearson's explanation of this phenomenon is that "we do a great job of teaching word identification skills but a lousy job of teaching comprehension skills" (p.3).

Lastly, many more disciplines have developed an interest in comprehension tasks. It is this shared curiosity of the human mind and its workings by linguists, sociolinguists, speech-art theorists, psychologists, computer scientists, and educators that has led to the search for understanding of the "relationships between what we know and how we understand when we read" (p.3).

The cumulative effects of the factors stated by Pearson (1981) and Samuels (1980) have led to more research in the last 8 years than in any time period prior (Pearson & Gallagher, 1983). Each of the studies has attempted to gain additional understanding of this concept labeled comprehension. While there is still much left to be discovered, a serious problem needs addressing with practical applications for the classroom.

The pragmatic problem is the decline in test scores at the upper elementary levels. It is at this level that the emphasis in assessment shifts from a multi-skill dimension (phoneme-grapheme association, basic sight vocabulary, structural analysis, and comprehension) to a more singular analysis (isolated vocabulary meaning and comprehension). The number of process components (the mechanical skills of reading) versus the product component (comprehension) items is decidedly different in the primary and intermediate batteries of the standardized tests. Practical ideas need to be developed that can be employed in the classroom to assist students in their comprehension of text.

Since much of the work done with comprehension in the classroom revolves around questioning the students about the reading they have done (Durkin, 1978-79), it would seem conducive to foster effective questioning techniques to improve comprehension. Questions have been seen as stimulatives to thinking (Artley, 1972; Cunningham, 1971; Gantt, 1970; Hoskisson, 1973; Hyman, 1982, Lucking, 1978).

There has been an extensive amount of research on the effects of questioning, but to date there has been none that incorporates Rowe's (1974a, 1974b, 1974c) "wait-time" findings in relation to reading comprehension. Rowe (1974a) has found that by extending the time between a teacher-posed question and solicitation of a pupil response, the likelihood of a response increases and more evidence is given by the student to support the answer. Yet it is this element of silence between question and answer that does not seem to exist in most classrooms (Anshutz, 1973; Arnold, Atwood, & Rogers, 1974; Atwood & Stevens, 1976; Boeck & Hillenmeyer, 1973; Hassler, 1980; Pritchard, 1976; Tobin, 1980). Garigliano (1972), Gambrell (1983), and Rowe (1974a) found that the average wait-time between the

teacher question and the student response was not much longer than 1 second.

Extending the amount of time students may use to think about the question may facilitate the comprehension process. Bartlett (1967), Brooks (1977) and Suchman (1979) maintain that readers must accomodate and assimilate the material they are reading with their existing knowledge structure. Following research on memory and reading reaction time, Brooks asserts that comprehension "is more a process which can be facilitated rather than a skill which can be specifically taught" (Brooks, 1977, p.152).

It is conceivable that we are not developing reading comprehension because we are not developing strategies that permit the formation of ideas. The quick question at the literal level of comprehension allows the quick answer, but deep structure comprehension that enhances through understanding may mandate additional time.

Dillon (1979) explains the need for adequate time by examining the speech patterns of students while giving explanations to questions. He found that when students were explaining or interpreting, they had longer pauses in their discourse; but when they were simply describing or retelling an event, there were shorter and less frequent pauses.

Additional time for conceptualization of an answer to the more sophisticated comprehension questions may be necessitated simply by virtue of the mental manipulations required to arrive at a reasonable answer. Stauffer (1977) says,

> If it is the essential task of the human mind to produce, analyze, and regulate concepts and scientific operations, then it must be the task of reading instruction to foster human cognition. Implicit in this is the concept of intention and the process of change premised on the hope of discovery and the discipline

of accuracy. One can conclude that "purpose of reading" like "intention in thinking" is crucial to comprehending. This being so, a teacher is obliged to nurture the inquiry process so that readers develop an active intelligence capable of projecting, weighing evidence, making critical deceisions, and doing constructive research. (p.242)

Researchers such as Cunningham (1971), Hyman (1982), Ladas and Asti (1973) and Lange (1982) agree with this necessity of extended time that permit the mental manipulations required in thinking. The mental tasks students must complete before an appropriate response can be made include interpreting the question, remembering relevent ideas, associating and judging these ideas, drawing a conclusion, and producing the right words with which to respond (Cunningham, 1971). Again, it becomes apparent that students need extra time before responding to a question.

It would appear that one method to improve comprehension at the higher cognitive levels is to extend the amount of time that the students may use to answer a question. To insure that the students can associate and incorporate material, sufficient time must be provided for them to make these connections. Quick-paced questioning may be legitimate in some instances, but it does little to foster in-depth thinking or to generate quality responses. "Students should have the opportunity to refine and clarify their ideas" (Gambrell, 1980, p.146).

Wait-time, which is the pause following a teacher question (Wait-Time I) and after a student response (Wait-Time II) has been well studied in the curricular areas of science and social studies with very favorable results. With the exception of one study by Gambrell (1983) which simply examined the amount of wait-time teachers used in their reading classes,

the benefits of extended wait-time have not been utilized in the field of reading instruction. It was the intent of this study to train teachers as economically as possible in the use of wait-time and have them employ this strategy in their discussion periods of basal reader stories. It was believed that by offering students additional time to formulate answers to questions before being asked to verbalize them, the responses would contain more communication units and more words as well as to increase the number of students responding to the questions.

Past studies have cooroborated the fact that an increase in wait-time can (a) increase the number of responses made by students, (b) increase the length of communication units made by students, and (c) change the type and number of questions posed by teachers (DeTure, 1980; Hassler, 1980; Rowe, 1974a).

This study replicates the assessment of increased wait-time on the length of student responses, average number of words per response, and the number of responses given to teacher questions, but analyzes these verbal outcomes at different cognitive levels. It is believed that responses to textually implicit teacher questions will have more communication units and more words per communication units as well as a larger number of responses to the textually implicit question; while textually explicit responses will have fewer communication units, fewer words in the communication units, and fewer number of responses to the textually explicit question.

The data for this experiment were collected by the researcher from 110 fourth-grade students and their respective six teachers who had volunteered to participate in the study. The subjects were from a middle-sized school district in Northeast Ohio. The students were randomly assigned

by class to treatment and control groups. All phases of the study were completed within the confines of the regular classroom by the assigned classroom teacher. One of the teachers in the control group and the 15 students in the class were eliminated from the final data analysis since the audio tape recordings were consistently inaudible and attempts to rectify the situation caused an ever-increasing delay in the scheduled assigned reading of selections and discussion sessions. This resulted in a final sample of 95 students and 5 teachers.

The fourth-grade teachers who volunteered to participate in the study were randomly assigned to treatment and control groups. Each teacher was given an individual training session with the researcher.

Training sessions with each of the three teachers assigned to the treatment group consisted of a brief review of the research by Rowe (1974) and others on wait-time effects. This review supplied the definition of wait-time (both Wait-Time I and II) and described the positive student outcomes of increased wait-time.

A hand-out was provided for the teachers that delineated how they were to attain and sustain Wait-Times I and II. The criterion wait-time for both types of wait-time was established at 5 seconds. The phrase, "If I wait 3 to 5 seconds, I will get better answers," said slowly and deliberately would produce the established criterion wait-time, plus be a reminder of the purpose of their usage of increased wait-time (Hassler, 1980). An alternative technique was to count slowly, saying the words, "One thousand one, one thousand two," etc., to one thousand five to achieve criterion wait-time. The teachers were to use whichever method they felt comfortable with, but they were encouraged to use the phrase because of its obvious implications.

The teachers were told to "set the stage" for this increased use of wait-time with their students by explaining to the students that they would now be given "think-time" (Gambrel, 1980) after a teacher question and a student response. Using statements such as, "My questions may be difficult so take your time in thinking about them" or "These questions might be complex so give them some thought before answering" would help remind the students to pause before raising their hands to answer. The students were to be cautioined not to call out answers, but they were encouraged to respond to each other's remarks.

The teachers were to be sure and keep the criterion wait-time consistent for all types of learners and for the duration of discussion period since wait-times might have a tendency to decrease as the discussion progresses.

Probing and soliciting remarks such as, "Tell me more about that" or "Why do you say that?" were to be employed by the teachers if students responded with only yes or no answers or if the response was confusing or appeared incomplete.

After this presentation, tape recordings of reading group story discussions were played. One of the tapes demonstrated the usual rapid-fire question/answer discussion. The second tape using the same questions about the same story incorporated the treatment approach of expanded wait-times following the teacher questions and the student responses. The differences between the level of responses of the students were discussed with the teachers.

Control group teachers met individually with the researcher. A brief presentation of the interest of researchers about reading comprehension

was conducted. The teachers were told that the experiment they would be involved in was concerned with how students respond to various levels of comprehension questions. The teachers were told that the experiment would analyze the information provided from their discussions of the selected stories with their students.

Four stories were chosen from the Houghton-Mifflin Reading Series, Kaleidoscope (1971), the basal text adopted for use with fourth-grade students by the school district. All students read the same reading selection within the same time period. In this way, the lesson material on which the teachers based their questions was held constant. The constant lesson topic made it possible to attribute variance in question asking to the teachers rather than to differences in the lessons (Gall, 1973).

The teachers held the usual oral discussion of the stories read by their students with each of their reading groups. Since the teachers' questions and student responses could be overheard by the other students in the classroom, the teachers rotated the discussions among the reading groups for the four stories.

The reading of the first selection and discussion was done two weeks prior to the commencement of the study and was used as a pretest measure. The other three readings and taped discussions were done during the 1st, 4th, and 7th week of the experiment. In the intervening weeks of the study, the teachers were to continue their usual reading plans. The treatment group teachers, however, were to use the increased wait-times with whatever reading activities they planned. In addition, the treatment teachers were requested to tape record and listen to one story discussion per week to monitor their use of criterion wait-time. Treatment group teachers were given feedback by the researcher on their use of wait-time after each taped session.

The actual schedule of data collection consisted of an assigned reading selection and taping, followed by two weeks of regular reading assignments over a 7-week period.

In the course of the study development, specific research questions were generated. The ability to test these research questions as described rather than artificially fitting them into pre-existing formats was the main reason multiple linear regression was chosen as the statistical procedure. The questions were reflected in regression models developed for testing.

The criterion variables in the regression models were the analysis of student responses from transcripts of the audio taped recordings. Predictor variables were those demographic factors that could be held constant (covaried) to assess the effectiveness of treatment in regard to the criterion variables. The hypotheses were tested at the .05 level of signficance with a one-tailed test; that is, directionality was ascribed. Correction for multiple comparisons was done with a Scheffe' to correct for Type I error buildup.

Results

Forty-eight recordings were generated from the four recordings sessions. These recordings were then transcribed. A panel of judges categorized all teacher questions from the transcripts into textually explicit, textually implicit and miscellaneous classifications (Pearson & Johnson, 1978). There were 918 teacher questions on the preexperimental recordings and 731 teacher questions on the final recordings.

Student responses were correlated with the type of teacher question and analyzed for the number of responses to the question, the average number of communication units in each response and the average number of words in each response to the question.

The data regarding the number of student responses to textually explicit teacher questions indicated significant interaction between treatment and reading ability level. Significant simple effects were found between treatment and high ability level students and treatment and middle ability level students. No significant difference was found between treatment and low ability level students.

For high ability level students, the control treatment was superior to the extended wait-time treatment; however, extended wait-time was superior to the control treatment for middle ability level students. Treatment was not a factor for the low ability level students in the number of responses to textually explicit teacher questions.

In predicting the number of student responses to textually implicit teacher questions, the data revealed significant differences between treatments. The extended wait-time treatment group had significantly more responses to textually implicit teacher questions than the control group. No significant interaction was found between treatment and reading ability level. Significant main effect was found for treatment in favor of the extended wait-time treatment. No significant differences were found for reading ability level.

The data regarding the average number of communication units to textually explicit teacher questions showed significant interaction between treatment and reading ability level. Significant simple effects were found for high ability level and low ability level students in the number of communication units in their responses to textually explicit teacher questions. No significant difference was found for middle ability level students. For both low ability and high ability level students, the extended wait-time treatment group was superior over the control group. It was particularly superior for the high ability level group.

In predicting the average number of communication units in student responses to textually implicit teacher questions, the data indicated significant interaction between treatment and reading ability level. Significant simple effects were found for all treatment groups in favor of the extended wait-time treatment over the control treatment. Extended wait-time was particularly superior for the high ability level students.

In regard to the average number of words in student responses to textually explicit teacher questions, the data indicated significant interaction between treatment and reading ability level. Significant simple effects were found for high ability and low ability level students in favor of the extended wait-time treatment. No significant differences were found between treatments for middle ability level students. Once again, the treatment of extended wait-time was particularly superior for high ability level students.

The data regarding the average number of words in student responses to textually implicit teacher questions revealed significant interaction between treatment and reading ability level. Extended wait-time treatment was significantly better than the control treatment for all reading ability level groups. Wait-time treatment was quite superior for the high and low ability level students, but not quite as much for middle ability level students.

Discussion

In the synthesis of the literature on wait-time by Tobin (1987) several critical research issues were delinated. First, past research in the investigations regarding wait-time have not determined what effect increased wait-time has on different types of learners. Given the results of this study, it appears that the amount of wait-time for different types of learners depends on the level of the response they are expected to deliver.

Disordinal interaction between treatment and reading ability level suggest discretion in the use of wait-time. In eliciting oral responses to textually explicit questions, no increase in wait-time was most beneficial for high ability level students. Middle ability level students, however, produced more responses with additional wait-time. For lower ability level students, the number of responses appeared to be uneffected by increased wait-time.

Interactional effects were also apparent in predicting the number of communication units and the number of words in the communication units to explicit questions. Examination of the simple effects demonstrated that increased wait-time was beneficial for high and low ability level students in increasing the quality of their responses, but this was not true for middle ability level students.

With textually implicit questions, significant differences in treatments were found for the number of oral responses to this type of question with the main effects showing increased wait-time as the favored treatment.

Interactional effects were again observed between treatment and reading ability level in predicting the number of communication units and words in these units to textually implicit questions. Inspection of the simple effects revealed increased wait-time as the preferred treatment for high, middle and low ability level students.

A second issue raised by Tobin was whether wait-time was instrumental in all areas of cognitive processing. The results of this study provide tenuous support for the notion that less wait-time is needed for processing of explicit questions as compared to implicit questions. This assumption is tempered with regard to the ability level of the student when dealing with explicit material. On the other hand, processing of implicit questions appears to mandate increased time regardless of ability level.

Finally, the question as to whether there is a relationship between increased wait-time and achievement is addressed in related research (Pond, 1987). In this research the author found that extended wait-time increased the number of correct responses to textually implicit questions on a standardized reading test. This did not hold true for textually explicit questions. This finding is reflective of the findings dealing with the oral responses to textually explicit and textually implicit questions.

Based on the results of this study, it would seem that use of increased wait-time should be tempered with regard to both content and context. Not all types of learners may benefit from additional wait-time under all conditions. Consideration of the ability level of the student and the type of cognitive functioning should be taken into account.

Although the results of this study need validation with other populations, there appears to be a need for increased time in which children are able to ponder, analyze and speculate on implicit questions. It is the researcher's opinion that the success of the extended wait-time was directly attributable to involving the students in the strategy. Training in the use of extended wait-time must not only be directed at teachers. Students need to be made aware of the strategy, have the value of the strategy explained to them and have the opportunity to use the technique throughout the school day.

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APPENDIX

Table 57

Results for Hypothesis 37

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis 37. Interaction between reading ability level and treatment accounts for a significant amount of variance in predicting the number of student responses to textually explicit teacher questions.							
Full Model: $Y_4 = (37.0000)U + (-12.2632)X_{39} + (.6000)X_{40} + (2.3455)X_{41} + (-20.0000)X_{42} + (1.7857)X_{43} + (0)X_{44} + E$	.3137						
Restricted Model: $Y_4 = (39.7180)U + (-2.0971)X_{14} + (0)X_{13} + (-7.3630)X_{10} + (-4.6468)X_{11} + (0)X_{12} + E$	.0811	94	2/88	.05	14.91	<.05	S

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

Table 38

Results for Simple Effects: Number of Responses

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. There is a significant difference in means of treatments for high reading ability level students in predicting the number of student responses to textually explicit teacher questions.							
Full Model: $Y_4 = (36.9636)U + (-12.2268)X_{39} + (.6364)X_{40} + E$							
Restricted Model: $Y_4 = (36.9636)U + E$	.1789	94	1/92	.05	9.911	.0001	S
Hypothesis. There is a significant difference in means of treatments for middle reading ability level students in predicting the number of student responses to textually explicit teacher questions.							
Full Model: $Y_4 = (34.8354)U + (4.7100)X_{41} + (-17.8354)X_{42} + E$							
Restricted Model: $Y_4 = (34.8354)U + E$	.1158	94	1/92	.05	5.960	.0037	S

(table continued)

Table 58 (continued)

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. There is a significant difference in means of treatments for low reading ability level students in predicting the number of student responses to textually explicit teacher questions.							
Full Model: $Y_4 = (31.9444)U + (6.8413)X_{43} + (5.0556)X_{44} + E$	.0720	94	1/92	.05	3.531	.0333	NS
Restricted Model: $Y_4 = (31.9444)U + E$							

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

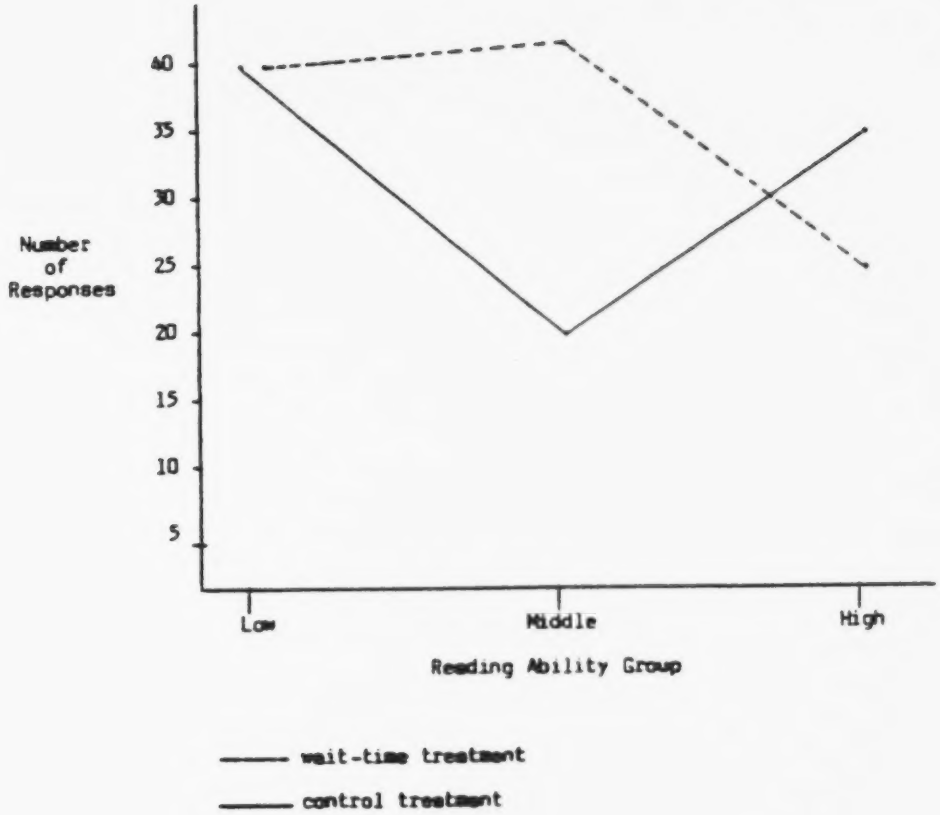

Fig. 2. Number of student responses to textually explicit models.

Table 59

Results for General Hypothesis 5

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
General Hypothesis 5. There is a significant difference in means of treatments in predicting the number of textually implicit teacher questions over and above the pretest.							
Full Model: $Y_5 = (6.2281)U + (10.3205)X_{14} +$ $(0)X_{15} + (-.2325)X_{20} + E$	.4586						
Restricted Model: $Y_5 = (10.2267)U + (-.6570)X_{20}$ $+ E$	.0078	94	1/91	.05	76.41	<.05	S

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

Table 60

Results for Hypothesis 38

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis 38. Interaction between reading ability level and treatment accounts for a significant amount of variance in predicting the number of student responses to textually implicit teacher questions.							
Full Model: $Y_5 = (6.5000)U + (0.1316)X_{39} + (-3.3000)X_{40} + (3.7727)X_{41} + (-3.5000)X_{42} + (5.7857)X_{43} + (0)X_{44} + E$	.3980						
Restricted Model: $Y_5 = (4.9281)U + (0.6027)X_{14} + (0)X_{15} + (.0901)X_{10} + (-2.9034)X_{11} + (0)X_{12} + E$	.3648	94	2/88	.05	2.44	>.05	NS

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

Table 61

Results for Main Effects: Reading Ability Level and Treatment

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. Reading ability level effects account for a significant amount of variance in predicting the number of responses to textually implicit questions over and above treatment effects.							
Full Model: $Y_5 = (4.5281)U + (8.6027)X_{14} + (0)X_{15} +$ $(.0501)X_{10} + (-2.5034)X_{11} + (0)X_{12} + E$	.3648						
Restricted Model: $Y_5 = (4.2778)U + (8.3946)X_{14} +$ $(0)X_{15} + E$	.3471	94	2/90	.05	1.2535	>.05	NS
Hypothesis. Treatment effects account for a significant amount of variance in predicting the number of responses to textually implicit questions over and above reading ability level effects.							
Full Model: $Y_5 = (4.5281)U + (8.6027)X_{14} + (0)X_{15} +$ $(.0501)X_{10} + (-2.5034)X_{11} + (0)X_{12} + E$	.3648						
Restricted Model: $Y_5 = (10.5500)U + (-1.7807)X_{10} +$ $(-2.2167)X_{11} + (0)X_{12} + E$	.0189	94	1/90	.05	48.7183	<.05	S

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

Table 62

Results for Hypothesis 39

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis 39. Interaction between reading ability level and treatment accounts for a significant amount of variance in predicting the average communication units in student responses to textually explicit teacher questions.							
Full Model: $Y_6 = (1.0000)U + (1.5842)X_{39} + (.1000)X_{40} + (.8909)X_{41} + (.2000)X_{42} + (1.2143)X_{43} + (0)X_{44} + E$	.6721						
Restricted Model: $Y_6 = (.9636)U + (1.2662)X_{14} + (0)X_{15} + (.2426)X_{10} + (-.1855)X_{11} + (0)X_{12} + E$	.6445	94	2/88	.05	3.7297	<.05	S

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

Table 63

Results for Simple Effects: Average Number of Communication Units

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. There is a significant difference in means of treatments for high reading ability level students in predicting the average number of communication units in student responses to textually explicit teacher questions.							
Full Model: $Y_6 = (1.8109)U + (.7733)X_{39} + (-.7109)X_{40} + E$							
Restricted Model: $Y_6 = (1.8109)U + E$	.4067	94	1/92	.05	31.188	.0001	S
Hypothesis. There is a significant difference in means of treatments for middle reading ability level students in predicting the average number of communication units in student responses to textually explicit teacher questions.							
Full Model: $Y_6 = (1.8367)U + (.0542)X_{41} + (-.6367)X_{42} + E$							
Restricted Model: $Y_6 = (1.8367)U + E$	.0306	94	1/92	.05	1.435	.2436	NS

(table continued)

Table 63 (continued)

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. There is a significant difference in means of treatments for low reading ability level students in predicting the average number of communication units in student responses to textually explicit teacher questions.							
Full Model: $Y_6 = (1.7907)U + (.4235)X_{43} + (-.7907)X_{44} + E$	.2362	94	1/92	.05	14.068	.0001	S
Restricted Model: $Y_6 = (1.7907)U + E$							

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

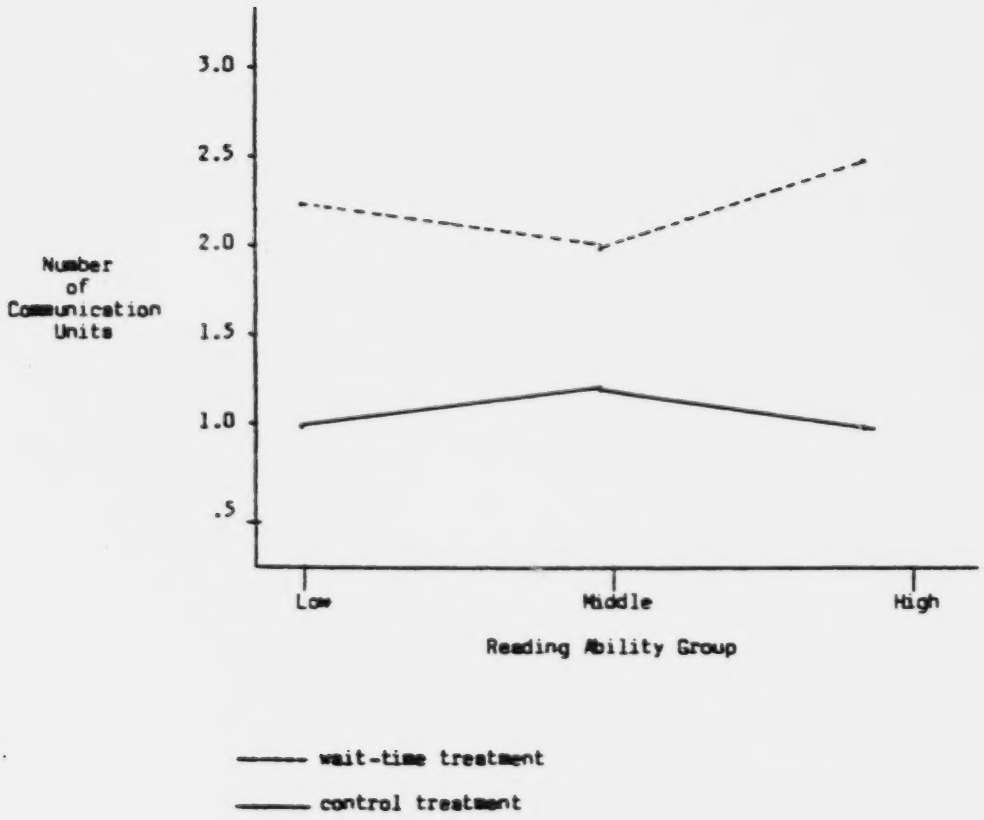

Fig. 3. Average number of communication units in student responses to textually explicit questions.

Table 64

Results for Hypothesis 40

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis 40. Interaction between reading ability level and treatment accounts for a significant amount of variance in predicting the average communication units to textually implicit teacher questions.							
Full Model: $Y_7 = (1.1500)U + (2.2868)X_{39} + (.1500)X_{40} + (2.3590)X_{41} + (.1500)X_{42} + (.4429)X_{43} + (0)X_{44} + E$	.8452						
Restricted Model: $Y_7 = (.4300)U + (1.4718)X_{14} + (0)X_{15} + (1.1942)X_{10} + (1.4109)X_{11} + (0)X_{12} + E$	.7047	94	2/88	.05	3>.05	<.05	S

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

Table 65

Results for Simple Effects: Average Number of Communication Units

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. There is a significant difference in means of treatments for high reading ability level students in the number of communication units to textually implicit teacher questions.							
Full Model: $Y_7 = (1.8582)U + (1.5787)X_{39} + (-.5582)X_{40} + E$							
Restricted Model: $Y_7 = (1.8582)U + E$	.4729	94	1/92	.05	40.822	.0001	S
Hypothesis. There is a significant difference in means of treatments for middle reading ability level students in the number of communication units to textually implicit teacher questions.							
Full Model: $Y_7 = (1.8849)U + (1.6142)X_{41} + (-.5949)X_{42} + E$							
Restricted Model: $Y_7 = (1.8949)U + E$	.2617	94	1/92	.05	16.125	.0001	S

(table continued)

Table 65 (continued)

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. There is a significant difference in means of treatments for low reading ability level students in the number of communication units to textually implicit teacher questions.							
Full Model: $Y_7 = (2.5019)U + (-.9090)X_{43} + (-1.3519)X_{44} + E$	.2524	94	1/92	.05	15.365	.0001	S
Restricted Model: $Y_7 = (2.5019)U + E$							

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

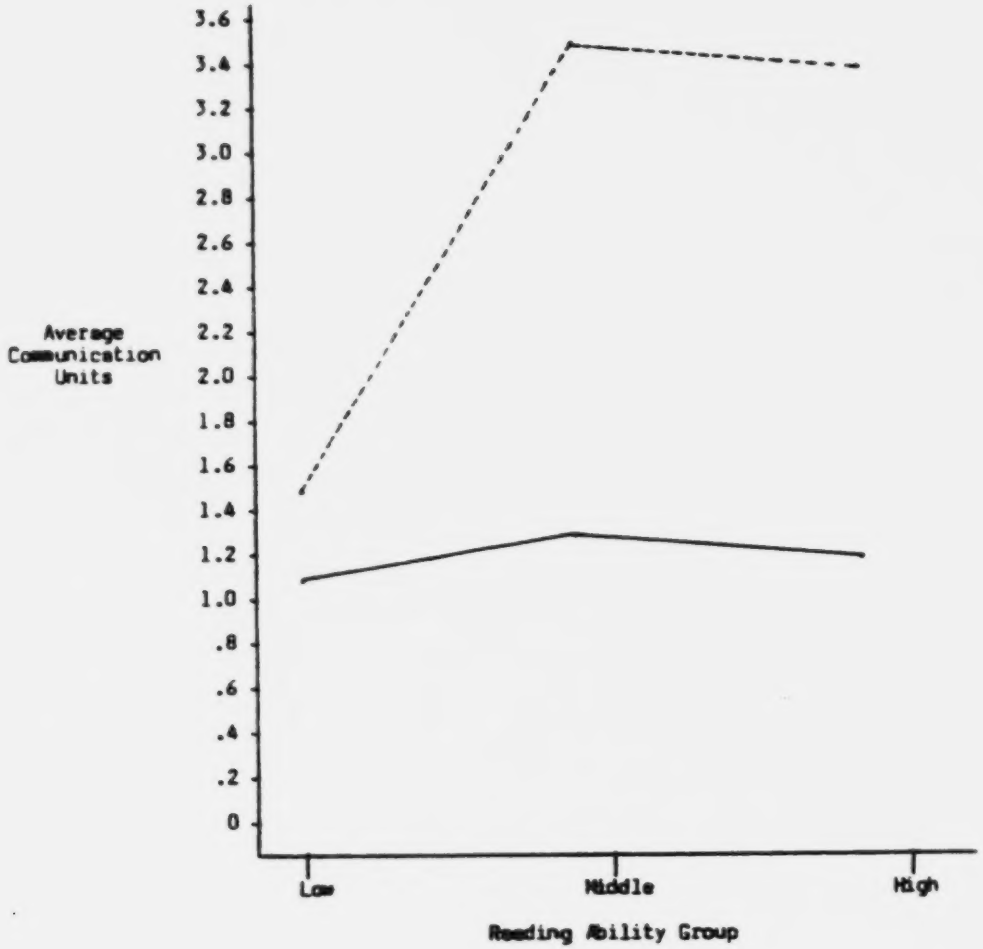

Fig. 4. Number of communication units to textually implicit questions.

Table 66

Results for Hypothesis 41

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis 41. Interaction between reading ability level and treatment accounts for a significant amount of variance in predicting the average number of words in student responses to textually explicit teacher questions.							
Full Model: $Y_B = (4.6000)U + (16.9684)X_{39} + (1.1400)X_{40} + (9.8910)X_{41} + (1.9000)X_{42} + (10.4464)X_{43} + (0)X_{44} + E$	.6709						
Restricted Model: $Y_B = (3.0976)U + (12.5927)X_{14} + (0)X_{15} + (4.2188)X_{10} + (.0277)X_{11} + (0)X_{12} + E$	.6330	94	2/88	.05	5.135	<.05	S

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

Table 67

Results for Simple Effects: Average Number of Words

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. There is a significant difference in means of treatments for high reading ability level students in the average number of words to textually explicit teacher questions.							
Full Model: $Y_B = (9.6453)U + (11.9231)X_{39} + (4.8456)X_{40} + E$							
Restricted Model: $Y_B = (9.6453)U + E$	.3970	94	1/92	.05	29.954	.0001	S
Hypothesis. There is a significant difference in means of treatments for middle reading ability level students in the average number of words to textually explicit teacher questions.							
Full Model: $Y_B = (12.6722)U + (1.8188)X_{41} + (-6.1722)X_{42} + E$							
Restricted Model: $Y_B = (12.6722)U + E$	.0352	94	1/92	.05	1.660	.1958	NS

(table continued)

Table 67 (continued)

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. There is a significant difference in means of treatments for low reading ability level students in the average number of words to textually explicit teacher questions.							
Full Model: $Y_B = (13.1481)U + (1.8983)X_{43} + (-8.5481)X_{44} + E$	.1777	94	1/92	.05	9.833	.0001	S
Restricted Model: $Y_B = (13.1481)U + E$							

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

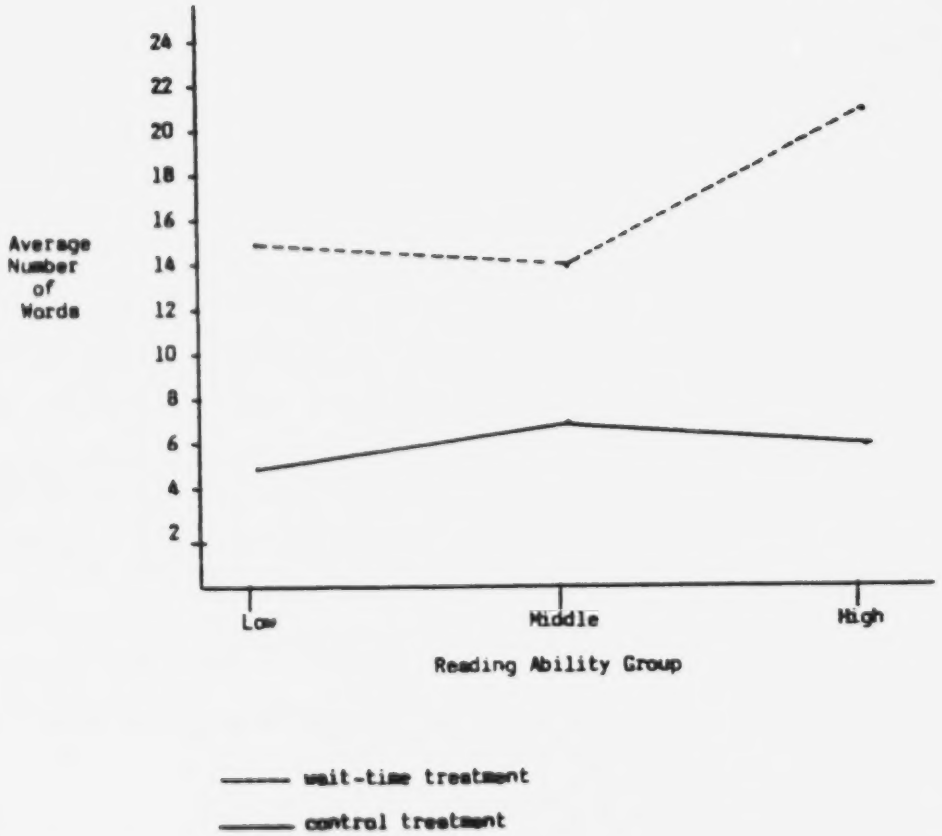

Fig. 5. Average number of words to textually explicit questions.

Table 68

Results for Hypothesis 42

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis 42. Interaction between reading ability level and treatment accounts for a significant amount of variance in predicting the average number of words in student responses to textually implicit teacher questions.							
Full Model: $Y_9 = (4.9000)U + (23.1211)X_{39} +$ $(5.4000)X_{40} + (18.7364)X_{41} + (1.1000)X_{42} +$ $(5.7464)X_{43} + (0)X_{44} + E$	.8039						
Restricted Model: $Y_9 = (-.1333)U + (12.9369)X_{14} +$ $(0)X_{15} + (12.7641)X_{10} + (9.4796)X_{11} +$ $(0)X_{12} + E$	.7153	94	2/88	.05	20.136	<.05	S

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

Table 69

Results for Simple Effects: Average Number of Words

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. There is a significant difference in means of treatments for high reading ability level students in the average number of words to textually implicit teacher questions.							
Full Model: $Y_9 = (11.6527)U + (16.3683)X_{39} + (-1.3527)X_{40} + E$							
Restricted Model: $Y_9 = (11.6527)U + E$	.5238	94	1/92	.05	50.047	.0001	S
Hypothesis. There is a significant difference in means of treatments for middle reading ability level students in the average number of words to textually implicit teacher questions.							
Full Model: $Y_9 = (13.8646)U + (9.7718)X_{41} + (-7.8646)X_{42} + E$							
Restricted Model: $Y_9 = (13.8646)U + E$	.1317	94	1/92	.05	8.135	.0006	S

(table continued)

Table 69 (continued)

Hypothesis and Models	R^2	N	df	Alpha	F	p	S/NS[a]
Hypothesis. There is a significant difference in means of treatments for low reading ability level students in the average number of words to textually implicit teacher questions.							
Full Model: $Y_9 = (18.9333)U + (-8.2869)X_{43} + (-14.0333)X_{44} + E$	.3166	94	1/92	.05	21.075	.0001	S
Restricted Model: $Y_9 = (18.9333)U + E$							

Note. See Chapter III, pages 88-90, for list of variables.

[a]S/NS = significant or nonsignificant.

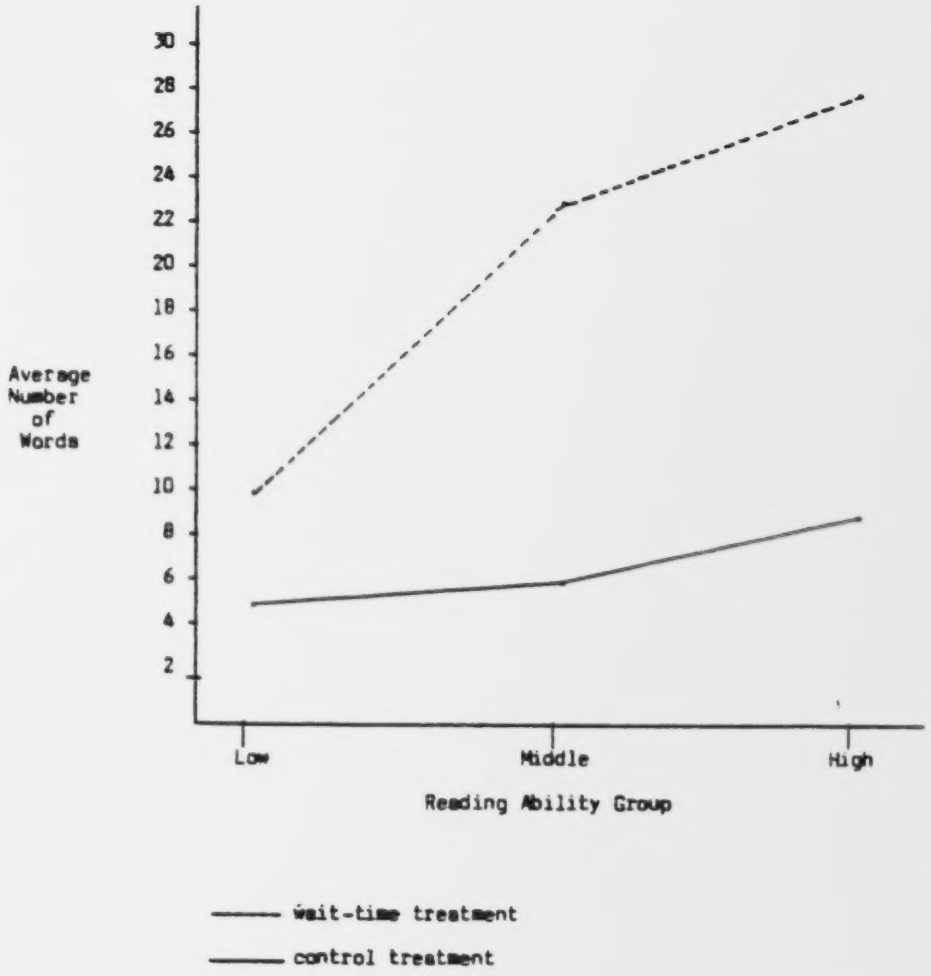

Fig. 6. Average number of words to textually implicit questions.